CLAIMS

What is claimed is:

1. A method of reducing calculations in the decoding of a M-ary modulated convolutionally coded signal in a radio communication system, the method comprising the steps of:

a) determining a single function for a soft-decision metric for each bit in a symbol by restricting the set of all possible Gray-coded constellation points to those closest to a boundary between a bit value of 0 and 1 for each bit in the input symbol and applying a predetermined function corresponding to the range of restricted constellation points to the entire possible range of symbols;

b) inputting a symbol having real part, x, and an imaginary part, y;

c) setting a soft-decision metric for each bit in the symbol using the predetermined function from the determining step;

d) outputting the soft-decision metrics for each bit of the symbol to a turbo decoder;

e) decoding the symbol in the turbo decoder; and

f) repeating steps a) through e) until all symbols to be input are decoded.

2. The method of claim 1, wherein the setting step includes a substep of scaling the soft-decision metrics.

3. The method of claim 2, wherein the scaling substep includes scaling the soft-decision metrics by a factor of $\beta A_d / A_p$, wherein β is the squared magnitude of the filtered pilot signal, and A_d and A_p are the data and pilot signal gains, respectively.

4. The method of claim 1, wherein the predetermined function of the determining step is defined by the difference between the squares of the distances between the restricted constellation points having 0 and 1 bit values and a hypothetical symbol falling within the range of restricted constellation points.

5. A method of reducing calculations in the decoding of an 8-PSK modulated convolutionally coded signal in a radio communication system, the method comprising the steps of:

a) providing a set of eight possible Gray-coded symbols for the 8-PSK modulated signal in a constellation;

b) defining radial boundaries in the constellation bisecting the points in the constellation;

c) inputting a symbol having real part, x, and an imaginary part, y;

d) plotting the location of the symbol in the constellation;

e) locating the two nearest constellation points to the symbol having a 0 value and a 1 value for each bit;

f) setting a soft-decision metric for each bit using the two nearest constellation points from the locating step;

g) outputting the soft-decision metrics for each bit of the symbol to a turbo decoder;

h) decoding the symbol in the turbo decoder; and

i) repeating steps a) through h) until all symbols to be input are decoded.

6. The method of claim 5, wherein the inputting step includes phase shifting the symbol by $e^{j\pi/8}$.

7. The method of claim 5, wherein after the setting steps, further comprising the step of scaling the soft-decision metrics.

8. The method of claim 7, wherein the scaling step includes scaling the soft-decision metrics by a factor of $\beta A_d / A_p$, wherein β is the squared magnitude of the filtered pilot signal, and A_d and A_p are the data and pilot signal gains, respectively.

9. A method of reducing calculations in the decoding of an 8-PSK modulated convolutionally coded signal in a radio communication system, the method comprising the steps of:

a) inputting a symbol having real part, x, and an imaginary part, y;

b) setting a soft-decision metric of the first bit of the symbol equal to the value of the imaginary part, y, of the symbol;

c) setting a soft-decision metric of the second bit of the symbol equal to the value of the real part, x, of the symbol;

d) setting a soft-decision metric of the third bit of the symbol equal to

$$(|x| - |y|)\frac{1}{\sqrt{2}}$$

e) outputting the soft-decision metrics for each bit of the symbol to a turbo decoder;

f) decoding the symbol in the turbo decoder; and

g) repeating steps a) through f) until all symbols to be input are decoded.

10. The method of claim 1, wherein the inputting step includes phase shifting the symbol by $e^{j\pi/8}$.